



Practitioner's Docket No.: 791\_119

PATENT

*Handwritten initials and date: 8.21.03*

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re the application of: Li YANG, Toshihiro YOSHIDA, and Hiroshi NEMOTO

Ser. No.: 09/686,408

Group Art Unit: 1745

Filed: October 11, 2000

Examiner: Gregg Cantelmo

Confirmation No.: 1042

For: LITHIUM SECONDARY BATTERY

**RECEIVED**  
AUG 19 2003  
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Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**DECLARATION UNDER 37 CFR §1.132**

Sir:

I, Toshihiro Yoshida, a citizen of Japan hereby declare and state:

1. I have a bachelor's degree in science which was conferred upon me by Tokyo University of Science in Tokyo, Japan, in 1988.

2. I have been employed by NGK INSULATORS, LTD. since 1988 and I have had a total of 5 years of work and research experience in the field of batteries, including lithium secondary batteries.

3. I am a co-inventor of the above-identified patent application and I am familiar with the references applied in the Office Action mailed April 14, 2003.

4. My publications include the following work in this field: 'A model of capacity fade caused by a reaction rate between electrolyte and intercalated Li in carbon in Li-ion battery', Proceeding of The 43rd Battery Symposium in Japan (2002).

5. The following experiment was conducted by me or under my direct supervision.

#### Purpose of Experiment

The purpose of this experiment is to show the proof that JP'631 cell can contain water and HF in a total concentration of more than 10,000 ppm in the battery.

#### Experimental

A  $\text{LiMn}_2\text{O}_4$  spinel was used as the positive electrode active substance. The  $\text{LiMn}_2\text{O}_4$  spinel powder was mixed with acetylene black as a conductivity-improving agent, a solvent and a binder to produce a slurry for the positive electrode. The slurry was coated on both sides of an aluminum foil 20  $\mu\text{m}$  in thickness so that the slurry thickness became about 100  $\mu\text{m}$  on each side to produce a positive electrode. Similarly, a negative electrode was produced using a carbon powder as a negative electrode active substance and coating both sides of a copper foil 10  $\mu\text{m}$  in thickness so that the coating thickness became about 80  $\mu\text{m}$  on each side. Using the positive electrode, the negative electrode and a separator made of a cellulose system polymer e.g., paper, a wound type electrode body was produced. The electrode body was placed in a case; then, a non-aqueous electrolytic solution was filled. The water and HF concentrations in the non-aqueous electrolytic solution were 10 ppm and 20 ppm, respectively. As the non-aqueous electrolytic solution, there was used a solution obtained by dissolving  $\text{LiPF}_6$  in a 50/50 mixed solvent of EC and DEC in a concentration of 1 mole/liter. Each battery had a capacity of about 10 Ah after initial charge. After 24 hours, the non-aqueous electrolytic solution was picked from the battery and the water and HF concentration in the solution was measured. As a result of measurement, the water concentration was 2,300 ppm and the HF concentration was 9,700 ppm.

6. I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine and/or imprisonment under Section 1001 of Title 18 of the

United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing therefrom.

Date: July 25, 2003

Toshihiro Yoshida  
Toshihiro Yoshida